

Transportation 2030 Plan
Project Performance Evaluation Technical Report
December 2004



METROPOLITAN
TRANSPORTATION
COMMISSION

Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, CA 94607
TEL (510) 464-7700
TTD/TTY (510) 464-7769
FAX (510) 464-7848
E-MAIL info@mtc.ca.gov
WEB www.mtc.ca.gov



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TRANSPORTATION
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TRANSPORTATION 2030 PROJECT PERFORMANCE EVALUATION STAFF

Doug Kimsey
Manager, Planning

Lisa Klein
Project Manager

Doug Johnson
Project Staff

**Evelyn Baker, Harold Brazil,
Robert Huang, Valerie Knepper
Therese Knudsen, Nancy
Okasaki**
Analysis

**Madhav Pai, David Reinke,
Damian Stefanakis (Dowling
Associates, Inc.)**
Travel Demand Forecasting
Project Cost Estimation

1. Report Summary

An important consideration in choosing future investments is the extent to which they help achieve the Transportation 2030 vision. In the months leading up to the preparation of the Draft Transportation 2030 Plan, MTC conducted a performance evaluation of over 400 projects. MTC's objective was to link potential investments to the Transportation 2030 goals and inform decisions about which new projects to recommend for inclusion and whether to recommit to existing projects with cost increases. The project performance evaluation represents an ambitious extension of the performance analysis for the 2001 Regional Transportation Plan, in which MTC assessed the performance of alternative investment packages but not of individual projects.

The project performance measures were developed in the spring of 2003 with input from partner transportation agencies, MTC's Advisory Council and other stakeholders. The measures correspond with the Transportation 2030 goals and include: collision reduction, seismic safety, system efficiency and reliability, connectivity and access, contributions to clean air, significance for goods movement, support for regional Smart Growth policies, and ability to address the transportation needs of disadvantaged communities. Additional analysis was conducted to measure the benefits offered by collections of projects in major travel corridors; these measures considered travel time savings and changes in vehicle emissions. In the course of the evaluation, MTC looked at potential investments ranging from freeway widenings for new carpool lanes and enhanced transit routes to transit-oriented development projects and pedestrian overcrossings of freeways. Among the projects considered were at least 40 projects proposed by members of the public, who were invited for the first time to submit their project ideas for the regional plan directly to MTC.

The evaluation generated a wealth of information and enabled comparison among investments addressing each of the Transportation 2030 goals. Many of the projects that rose to the top for each goal were ultimately included in the Draft Transportation 2030 Plan. With the Transportation 2030 project performance evaluation, MTC took an important first step in measuring the contributions of specific investments toward regional goals and using this information to inform investment decisions. MTC has identified a number of steps to build on the accomplishments to date and sharpen the assessment of potential investments for future long-range transportation plans:

- MTC and partner agencies must consider how to better time the project performance analysis so results are available when discussions about county and regional investments get under way. An area that deserves special scrutiny is how to use performance measures to evaluate projects before voters have endorsed a project and committed to funding it through a local sales tax measure.
- MTC will focus on a smaller number (perhaps 100) of truly major projects to examine their costs and benefits in more depth. These could include big-ticket items, projects likely to have regionally significant impacts, and investments closely aligned with MTC policy initiatives such as lifeline transportation or coordination of transportation and land use.
- MTC will continue to review emerging practices and analysis tools for evaluating difficult-to-measure goals such as a Reliable Commute and Livable Communities.

2. Background: A New Initiative to Measure Project Performance

Legislation enacted in 2002, (Senate Bill 1492, Perata) established new requirements for MTC to evaluate projects prior to their inclusion in Transportation 2030 and future long range transportation plan updates. Specifically, the law (included in Attachment 1), required MTC to:

1. Adopt performance measurement criteria at the project and corridor level (with a deadline of July 1, 2003 for the measures for Transportation 2030).
2. Adopt measurable goals and objectives for RTP corridors.
3. Evaluate all projects and programs in Transportation 2030 and future Regional Transportation Plan (RTP) updates using the adopted measures and objectives. The requirement excludes projects in Track 1 of the 2001 RTP.

The new requirements challenged MTC to provide better information for investment decisions. They called for a substantially different approach to performance analysis from that in the 2001 RTP, for which MTC undertook system-level performance analysis of the alternatives defined in the Environmental Impact Report (EIR). The system-level analysis considered the impact of the alternative investment packages as a whole whereas the new requirements called for more detailed project and corridor-level analysis. Several challenges associated with project-level evaluation were apparent right from the start:

- Defining a set of performance measures, quantitative and qualitative, that can be applied consistently and comparably across individual projects that range substantially in scope, scale and sphere of impact.
- Collecting background information and generating the necessary performance data on hundreds of projects, many of which are defined at a conceptual level as befits a 25-year planning document.
- Timing the performance analysis. The analysis needed to be conducted late enough so that a meaningful set of potential investments could be identified for evaluation but early enough to inform key decision points in the RTP update process.

With these challenges readily apparent, MTC embarked on a 15-month process to define and conduct a project performance evaluation in conjunction with the development of the Transportation 2030 plan.

3. Measurement Criteria and Evaluation Framework

The Transportation 2030 project performance measures and corridor objectives were developed in the spring of 2003 with input from a committee of partner transportation agencies, members of the MTC Advisory Council, and other interested stakeholders. Attachment 2 lists the participants in this effort. The joint committee met several times between January and the end of May 2003 to advise MTC on corridor goals and objectives and project performance measures. A number of principles figured prominently in the discussions of the joint committee including:

- MTC's evaluation should focus on regionally significant projects to make the evaluation meaningful and manageable. Early on, projects with total cost greater than \$5 million were defined to be regionally significant.
- The evaluation should focus on projects considered likely candidates for inclusion in the financially constrained portion of the plan, as these projects are considered top priority for expected future funding.
- The evaluation should be based on consistent, quantitative information to the extent possible; however, the process should allow for consideration of additional qualitative information as well.
- The evaluation should compare benefits to costs and should consider full project lifecycle costs (capital costs and operating and maintenance costs).
- Projects would be evaluated first and foremost relative to the primary objectives they address.
- For the first time, members of the public would be invited to submit their project ideas directly to MTC.

The committee's discussion was influential in shaping the approach ultimately adopted by the Commission with MTC Resolution No. 3654 (June 2003). The Resolution sets forth a set of "universal" corridor objectives that apply, at some level, to all corridors and thus allow projects to be assessed on a common basis. It also sets forth a set of performance measures that fit within the framework of the Transportation 2030 Goals and universal corridor objectives. The performance measures can be grouped into two main categories:

1. Measures of need are intended to assess the future need for individual improvements relative to the corridor objectives. These measures allow evaluation of a wide range of projects on a consistent basis.
2. A smaller set of measures are intended to assess the impacts of groups of projects on travel within a corridor. These measures consider improvements in average travel time, amount of travel by private vehicles, vehicle emissions and the value of travel time savings, which is compared to the cost of the investments in the corridor. This approach captures the interactive effects of projects.

Exhibit 1 lists the adopted performance measures and illustrates their relationship to the Transportation 2030 Goals¹ and corridor objectives. MTC Resolution No. 3654, which

¹ The corridor objectives and project performance measures were initially developed based on 2001 RTP Goals and adopted in June 2003, in accordance with the legislative deadline. In December 2003, the Commission adopted a revised statement of Goals for Transportation 2030. The Transportation 2030

includes more detailed definitions for the adopted performance measures, is shown in full in Attachment 3.

With adoption of MTC Resolution No. 3654, the Commission also better defined which projects would be subject to the project evaluation in order to meet the legislative intent to provide better information for decision making. First, though the law exempts projects already included in the 2001 RTP, MTC Resolution No. 3654 extended the evaluation to projects in 2001 RTP with major scope changes or where regional funding needs increased by more than 30 percent. Second, the Commission chose to concentrate resources on evaluating the more significant and imminent investment decisions by exempting smaller, lower cost projects; projects with total cost less than \$5 million were exempt from the evaluation. Furthermore, the Commission prioritized the evaluation of projects considered likely candidates for the “financially constrained” portion of Transportation 2030. The financially constrained portion includes those projects that would be funded with future funding from existing revenue sources. As time allowed, MTC staff also would evaluate some projects likely to be funded only with the realization of new revenue sources (such as a regional gasoline tax or new county ½ cent sales taxes) or increased funding levels for existing revenues sources (such as increases in the state or federal gasoline tax). But MTC did not expected to evaluate all such projects. Finally, the Commission established criteria to screen out infeasible or insufficiently defined concepts.

Goals are similar enough in concept to the 2001 RTP Goals that the corridor objectives and performance measures are easily mapped to the new goals.

Exhibit 1

Project Performance Measures in Relation to Transportation 2030 Goals and Corridor Objectives

Transportation 2030 Goals and Measures	Adopted Corridor Objectives	Adopted Performance Measures
A Safe and Well Maintained System	Minimize injuries and loss of life in the event of seismic failure or collisions/other safety incidents	<ul style="list-style-type: none"> Persons at risk in event of seismic failure Is project on Caltrans lifeline system? Recent history of collisions or security incidents Future wear and tear on roads and transit
	Reduce maintenance and rehabilitation shortfalls	
A Reliable Commute	Operate the system more reliably Operate the system more efficiently Increase capacity and reduce bottlenecks through strategic expansion Improve connectivity Improve access to the regional transportation system for passenger Operate the system with greater attention to customer service	<ul style="list-style-type: none"> Roadways - future crowding Transit - on-time performance Roadways - future crowding Transit - Crowding (load factor), ridership and capacity User benefit measure¹ reflects travel time savings Qualitative assessment of gap or connectivity Improved transit connections - future levels of connecting services Improve highway connections - future number Transit - future transit boardings at station Roadways - population and job growth in adjacent areas Assessment of customer service needs
Access to Mobility	Address the transportation needs of the region's most disadvantaged households	<ul style="list-style-type: none"> Is project intended to serve an identified community of concern from the 2001 RTP Equity Analysis? Is project an identified Lifeline transit route? Is project intended to revitalize and urban area? Is project from a community-based transportation plan?
Livable Communities	Support the MTC-ABAG Smart Growth policies and objectives	<ul style="list-style-type: none"> Does project implement MTC-ABAG Smart Growth policies and objectives? Does project enable community residents to use a range of modes to access daily activities within the community? Does project support a community's development and/or redevelopment activities?
Clean Air	Protect the environment/public health - air quality	<ul style="list-style-type: none"> Is the project a state or federal TCM? Change in emissions¹
Efficient Freight Travel	Improve access from ports and airports Operate the system more efficiently Increase capacity and reduce bottlenecks through strategic expansion	<ul style="list-style-type: none"> Projected future increase in cargo Roadways - future crowding (V/C ratio) Transit - Crowding (load factor), ridership and capacity User benefit measure¹ reflects travel time savings for trucks

Notes: ¹ Corridor benefit measure. Will be use to assess impact of groups of projects at the corridor level.

4. Conducting the Evaluation

In the fall of 2003, members of the public and partner agencies submitted over 500 projects for MTC's review. Partner agencies were asked to coordinate with their county congestion management agencies (CMAs) in determining which projects to submit. Members of the public were invited to submit their project ideas directly to MTC by visiting the agency website, resulting in approximately 60 submittals.

After applying the adopted screening criteria, MTC staff determined that roughly 400 projects were eligible to continue through the project evaluation. Projects carried through the evaluation included investments as varied as major transit expansions, new HOV lanes, interchange improvements, local roadway widenings and connectivity improvements, bicycle and pedestrian paths, sidewalk improvements, replacement parking to facilitate transit oriented development, freeway traffic operations system improvements, and expansion of regional customer service programs such as the 511 traveler information system. The vast majority of projects, about 350 in all, were "new" projects not included in the 2001 RTP. Approximately 40 of the projects carried through the evaluation were ideas submitted by members of the public. These are listed in Attachment 4.

The majority of the 100 projects dropped from the evaluation fell into "exempt" categories because the total cost was less than \$5 million or because the project was already in the 2001 RTP and there was no significant change in cost or scope. A small number of project ideas from members of the public failed the screening criteria because they would be too expensive to fund within the confines of Transportation 2030 (e.g., BART extensions to Stockton or Sacramento) or because they were policy suggestions rather than investment proposals (e.g., institute regional review of specific plans at rail extension stations) and would be more appropriately assessed in the context of Transportation 2030 policy deliberations.

The analysis methodology applied to the 400 projects carried through the evaluation is described briefly below. Attachment 5 includes a more detailed discussion of the methodology for the individual performance measures.

Project Needs Assessment

In this part of the evaluation, MTC evaluated projects using the performance measures that assess future needs relative to the adopted corridor objectives. (For a list of the needs assessment performance measures and corridor objectives, refer to Attachments A and B in MTC Resolution No. 3654, shown in Attachment 3 to this report.) As MTC staff began the analysis, it quickly became apparent that even after screening out projects costing less than \$5 million, the number of projects as well as their range in size and scope still posed a considerable challenge. As a result, MTC staff divided the projects into two groups. Projects likely to have regional impacts and those tied strongly to MTC policy interests were selected for a detailed needs assessment which measured the extent of future needs associated with the corridor objectives. The remaining projects were assessed on a yes/no basis which considered whether or not projects addressed the

corridor objectives, but did not attempt to measure the associated needs. These projects tended to be either mainly local (e.g., improvements to smaller, local roadways) or programmatic (e.g., citywide pedestrian improvements), making them more difficult to assess using the regional travel model and, in the case of more localized projects, less significant from the standpoint of regional transportation investments.

Approximately half the projects were selected for the detailed needs assessment. These projects included major capacity expansions, significant operational improvements, projects that close gaps in regional transportation networks, and projects with significant impacts for environmental justice or smart growth. Projects received a high to low rating based on the results for the performance measures associated with each corridor objective the project addressed, in essence the severity of the future needs the project was intended to address. For the sake of consistency, data for the measures were derived largely from MTC regional travel demand model forecasts for year 2025². Because the evaluation framework was mainly intended to evaluate new projects (those not in the 2001 RTP), the forecasts used to assess needs assumed implementation of investments in the 2001 RTP. For some measures, where future needs could not easily be forecast, needs were assessed relative to current conditions or qualitative factors. MTC depended heavily on those who submitted the projects to determine which objectives the projects addressed.

Corridor Benefits Analysis

This part of the evaluation was used to assess the impacts of groups of new projects at the corridor level by looking at corridor travel with and without the improvements. The analysis used the travel corridors defined in the 2001 RTP and assessed benefits in year 2025. Three categories of corridor benefits were measured using MTC's regional travel demand model: user benefits based on the value of travel time savings (but not including the value of emissions reductions or safety improvements); changes in average travel time, an indicator of accessibility; and changes in vehicle miles traveled and motor vehicle emissions.

MTC staff grouped the new projects into three alternatives for comparison against the "base case". As with the needs assessment, the corridor benefits analysis was focused on assessing new projects so the base case was defined as the 2001 RTP program of investments. The three alternatives are described briefly below:

Alternative 1: System Management & Local Access

This alternative consists of operational and system management projects (such as freeway traffic operations system (TOS), auxiliary lanes, ramp metering, arterial signal timing with transit pre-emption, and transit proof-of-payment systems for Muni and AC Transit.) The alternative also includes a number of local roadway

² All MTC travel demand forecasts for the needs assessment and corridor benefits assessment are based on Projections 2003, the latest demographic and land use assumptions adopted by the Association of Bay Area Governments and the same assumptions use in the Transportation 2030 Draft Environmental Impact Report.

access alternatives such as local interchange improvements and local roadway widenings.

Alternative 2: Capacity Expansion

This alternative includes, in addition to all the system management and local access projects from Alternative 1, projects thought likely to be considered for future funding from existing revenue sources (i.e., projects thought to be candidates for the “financially constrained” portion of Transportation 2030). In fact, most of these projects cannot be funded unless new revenues are found; however, this was not apparent when MTC staff initiated the analysis.

Alternative 3: Further Expansion

This alternative includes, in addition to the projects in Alternatives 1 and 2, projects that were known to require new revenues. Many of the big ticket projects in new or renewed sales taxes expenditure plans proposed for the November 2004 ballot are in this alternative. In addition, since most transit operators face transit operating shortfalls over the Transportation 2030 period, this alternative includes most of the major transit service expansion projects.

The alternatives are cumulative so that Alternative 2 includes all projects in Alternative 1, and Alternative 3 includes all projects in Alternatives 1 and 2. This reflects the likelihood that system management investments would be pursued before or in concert with the major expansion and, further, that first tier capacity expansion investments would likely be pursued before those clearly requiring new revenues.

By necessity, the three alternatives included only those projects that can be represented in the regional travel demand model (e.g., operational improvements, transit service changes and capacity expansion). Bicycle and pedestrian projects, maintenance and rehabilitation projects, and programmatic investments were not included in this part of the evaluation.

Costs

MTC's intent was to compare project benefits and costs, reflecting full lifecycle project costs. MTC reported capital costs for each project alongside results for the project needs assessment so that projects addressing similar needs could be compared on the basis of cost. In addition, MTC staff used project capital and operating costs for the benefit-to-cost measure in the corridor benefits analysis. Attachment 5 includes a further discussion of project cost estimates and the methodology for calculating costs in the benefit-to-cost measure.

Additional Evaluation of Projects with Freight Benefits

MTC asked the study consultant for the Regional Goods Movement Study to conduct a more detailed review of potential benefits for freight movement to complement the project performance evaluation. Though the performance measures used in the additional review were not adopted by the Commission in MTC Resolution No. 3564, the analysis

provides additional useful information that could help inform investment decisions. The consultant for the Regional Goods Movement Study identified those projects from the performance evaluation that appeared to have benefits for freight and developed the following information for each project:

- Map showing the number of freight-dependent businesses in the project area that are likely to benefit directly from the project.
- Current data (such as number of trucks, type of trucks and number of truck related accidents) describing goods movement near the project location
- Year 2025 volume to capacity ratio assuming the project is not built
- Summary of potential project benefits

5. Evaluation Results and Observations for Future Work

The project performance evaluation highlights how projects address Transportation 2030 Goals by measuring the future needs they address as well as impacts of groups of projects on corridor travel. The results show that, in general, projects in the Draft Transportation 2030 Plan do support the Transportation 2030 Goals. Many of the highly rated projects, including several submitted by members of the public, are included in the Draft Transportation 2030 Plan. Some of the projects in the draft plan that were submitted for evaluation by members of the public are:

- Richmond San Rafael Bridge bicycle lane
- Caltrain grade separations
- Sonoma Marin Area Transit (SMART) Commuter Rail
- Numerous expanded enhanced bus services and bus rapid transit in San Francisco and the East Bay
- Numerous expanded express bus services throughout the region

The evaluation results were reviewed by the Commission in April 2004 and transmitted to the county congestion management agencies for consideration in developing county lists of projects proposed for inclusion in Transportation 2030. The evaluation results are presented in Attachments 6 through 8, as follows:

Attachment 6 contains a summary of the project performance results that are of primary interest to the Commission because they represent the more significant investment decisions in terms of cost or because the projects are regional in nature. The summary includes higher cost projects for which a detailed needs assessment was conducted. The last pages of the summary list all projects that are regionwide in scope. (Recall that projects in the detailed needs assessment include major capacity expansions, significant operational improvements, projects that close gaps in regional transportation networks, and projects with significant implications for environmental justice or smart growth.)

The table gives project-by-project results for the needs assessment portion of the analysis. Projects are listed by county and, to facilitate a general comparison among projects addressing similar objectives, the projects are grouped by the main objective addressed. Thus, it is possible to see which projects address the most severe future needs for each objective as well as which projects meet a variety of other objectives. Project cost estimates are also included in the results, making it possible to take cost into consideration.

Attachment 7 shows the needs assessment results for all projects sorted by county and corridor for easy reference. This listing includes projects subjected to the detailed and yes/no evaluations.

Attachment 8 contains several tables showing results for each measure in the corridor benefits analysis. Selected results from the tables in Attachment 8 are also shown below. The tables show results by corridor, but should be read with some caution as the impacts of some projects may show up in corridors where they are unexpected. For example, a project in the Golden Gate corridor may yield benefits reported in the North Bay East West corridor (as well as the Golden Gate Corridor) if a substantial number of trips starting or ending in the North Bay East West corridor travel on US 101 for part of their trip. For similar reasons, improvements in the Tri Valley corridor may translate to benefits also reported in the Sunol Grade corridor. This factor makes it somewhat challenging to interpret the results at the corridor level.

It is worth noting that because this analysis uses the 2001 RTP investment program rather than a “no-build” scenario as the base case for measuring corridor benefits, the associated benefits are not comparable to typical comparative analyses such as in the Transportation 2030 Environmental Impact Report or the 2001 RTP Performance Evaluation. In general, the benefits measured this way are less pronounced than in prior analyses. For example, the total regional annual travel time savings for the System Management & Local Access Alternative is 8 million hours and that for the Capacity Expansion alternative is 27 million hours. By comparison, the 2001 RTP Alternative was projected to result in 89 million hours saved compared to the 2001 RTP No Project Alternative.

Average Travel Time

See Tables A and B below and Tables 1 through 3 in Attachment 8.

In most corridors the decreases in Alternatives 1 (System Management and Local Access) and 2 (Capacity Expansion) are quite modest. There are moderate decreases, one half minute or more, in average travel time in a few corridors under Alternative 2 and in several corridors under Alternative 3 (Further Expansion). While a decrease of one half minute sounds small, it is not insignificant since the average is for all types of trips. It is possible to see the results of some specific investments by looking at average travel time by mode. For example, the decreases in average transit travel time are more pronounced in Alternative 3, which has heavy transit expansion, than in the other alternatives, which have relatively little transit expansion. The Eastshore North and Eastshore South corridors illustrate this behavior. In Alternatives 1 and 2 the modest decreases in average transit travel time in corridors such as the North Bay East West and Silicon Valley reflect roadway improvements that increase bus speeds. The changes in average travel time are not always intuitive. For example, it is not clear why average travel time in the Sunol Gateway corridor would increase under Alternative 1, which implements Caltrans freeway traffic operations system in the corridor; these results appear to be anomalous.

Table A: Average Travel Time per Trip, All Modes (minutes)

Corridor	Base Case 2001 RTP Investments	Change From Base Case		
		Alt. 1: System Management & Local Access	Alt. 2: Capacity Expansion	Alt. 3: Further Expansion
Regional	20.5	-0.1	-0.2	-0.3
Golden Gate	20.1	-0.2	0.0	0.0
North Bay East-West	56.6	0.4	1.4	-1.5
Napa Valley Subarea	17.5	-0.1	-0.2	-0.4
Eastshore North	13.9	0.0	-0.1	-0.1
Delta	18.9	0.0	-0.5	-0.6
Diablo	16.8	0.0	-0.2	-0.3
Sunol Gateway	57.5	2.9	-0.1	-1.1
Tri-Valley	17.2	0.3	0.1	0.0
Eastshore South	17.5	0.0	-0.1	-0.2
Fremont-South Bay	18.8	0.0	-0.1	-0.1
Silicon Valley	19.8	-0.1	-0.2	-0.2
Peninsula	22.4	-0.3	-0.6	-0.6
San Francisco Countywide	22.1	0.0	-0.2	-0.2
Transbay (1)	57.3	-0.2	-0.3	-0.7

(1) Includes Bay Bridge, San Mateo-Hayward Bridge, Dumbarton Bridge and Richmond-San Rafael Bridge corridors.

Table B: Average Travel Time per Transit Trip (minutes)

Corridor	Base Case 2001 RTP Investments	Change From Base Case		
		Alt. 1: System Management & Local Access	Alt. 2: Capacity Expansion	Alt. 3: Further Expansion
Regional	45.5	-0.1	-0.6	-0.6
Golden Gate	61.4	-0.4	0.4	0.1
North Bay East-West	130.4	-1.4	-8.0	-5.1
Napa Valley Subarea	42.6	0.0	-0.5	-0.3
Eastshore North	33.7	0.5	-0.6	-1.3
Delta	55.2	-0.1	-1.0	-0.4
Diablo	56.2	-0.3	-0.6	-1.1
Sunol Gateway	104.0	1.0	-0.4	-0.8
Tri-Valley	63.6	-0.1	-0.4	-0.9
Eastshore South	42.1	0.0	-0.4	-1.8
Fremont-South Bay	53.5	0.1	-0.1	-0.7
Silicon Valley	49.8	-0.1	-0.2	-0.4
Peninsula	62.2	-0.2	-0.5	-1.4
San Francisco Countywide	32.9	-0.1	-0.9	-0.8
Transbay (1)	65.0	-0.1	-0.6	0.0

(1) Includes Bay Bridge, San Mateo-Hayward Bridge, Dumbarton Bridge and Richmond-San Rafael Bridge corridors.

Vehicle Miles Traveled (VMT) and Emissions

See Tables C and D below and Tables 4 through 7 in Attachment 8.

The changes in daily VMT and emissions also are quite modest. VMT increases slightly in a number of corridors in Alternatives 1 and 2, but regionwide, the increase was less than one half a percent from the base. In Alternative 1, the biggest increase in VMT (420,000) occurs in the Eastshore North corridor, possibly as a result of the auxiliary lanes added in Solano County in this alternative. This number increases marginally in Alternative 2, which includes HOV extensions in Contra Costa County, and in Alternative 3, which may reflect improvements at the I-80/I-680 interchange. In the Golden Gate Corridor, VMT increases marginally in Alternative 1, which includes freeway operational improvements, and decreases in Alternative 3, which includes the SMART commuter rail. The changes in vehicle emissions track with VMT, but remain quite small in magnitude, reflecting stringent regulations on vehicles and fuels intended to cut emissions per mile.

Table C: Daily Vehicle Miles of Travel (000s)

Corridor	Base Case: 2001 RTP Investments	Change From Base Case		
		Alt. 1: System Management & Local Access	Alt. 2: Capacity Expansion	Alt. 3: Further Expansion
Regional (1)	170,330	460	390	-490
Golden Gate	11,580	180	0	-130
North Bay East-West	3,960	-100	-80	-160
Napa Valley Subarea	1,920	30	30	30
Eastshore North	13,170	410	580	630
Delta	6,210	-130	30	-10
Diablo	13,940	10	-290	-240
Sunol Gateway	10,770	-180	-490	-620
Tri-Valley	12,450	-20	-10	-40
Eastshore South	18,170	160	400	120
Fremont-South Bay	16,280	140	350	270
Silicon Valley	42,930	-80	50	-70
Peninsula	24,610	-10	30	-50
San Francisco Countywide	7,430	-40	-70	-80
Transbay (2)	12,160	60	-10	-60

(1) Regional estimate is not equal to the sum of all corridors, which are overlapping.

(2) Includes Bay Bridge, San Mateo-Hayward Bridge, Dumbarton Bridge and Richmond-San Rafael Bridge corridors.

Table D: Daily Motor Vehicle Emissions (KG/day)

	Total Regional Emissions			
	ROG	NOx	PM ₁₀	PM _{2.5}
Base Case 2001 RTP Investments	19,220	21,460	2,980	3,010
Change from the Base Case				
Alt. 1: System Management & Local Access	20	60	10	10
Alt. 2: Capacity Expansion	-40	20	-10	-10
Alt. 3: Further Expansion	-80	-80	-30	-30

User Benefit

See Table E below and Tables 8 and 9 in Attachment 8.

This measure was calculated at the regional level only due to the difficulty of assigning benefits and costs to individual corridors. User benefit is composed of the value of travel time savings and out-of-pocket cost savings with the vast majority benefit accruing from travel time savings. Savings in out-of-pocket costs are composed of savings in transit fares, bridge tolls and auto-operating costs that accrue as travelers change modes or spend less time in traffic. The results show a substantial increase in user benefits along with the level of investment.

Alternative 1, with an emphasis on system management and local access, generates \$187 million in user benefit annually. It is worth noting that this measure does not reflect user benefits due to reliability improvements, which are a principal benefit of system management projects such as those in Alternative 1; so the figure reported here may understate the benefits of such projects. User benefit grows more than three-fold with Alternative 2, which adds a number of expansion projects, and more than five-fold with the additional expansion in Alternative 3. It is interesting to note that even in Alternative 3, which includes aggressive transit expansion, the majority of user benefits accrue to auto users. This is not surprising since a large majority of trips are by automobile. By the same token, in Alternatives 1 and 2, which have practically no transit improvements, transit users benefit noticeably from roadway improvements which increase bus speeds.

The sense that benefits increase in proportion to investment is confirmed by the benefit-to-cost ratio in which user benefits are compared to public expenditures. Alternative 1 yields a benefit-to-cost ratio of 1.0. The ratio increases to 1.2 with Alternative 2, suggesting capacity expansion can be a cost-effective strategy. For Alternative 3, the benefit-to-cost ratio is again 1.0. However, the benefit-to-cost ratio for the alternatives cannot be taken as indicator of the cost-effectiveness of any individual project, as benefits are averaged across all projects and synergistic effects of all projects working together may generate benefits in the aggregate that cannot be attributed to individual projects.

Table E: Daily Motor Vehicle Emissions (KG/day)

	Alt. 1: System Management & Local Access	Alt. 2: Capacity Expansion	Alt. 3: Further Expansion(1)
User Benefits			
Total Annual Travel			
Time Savings (000s of hours)	8,703	27,674	42,143
Value of Annual			
Travel Time Savings (\$000,000) (2)	\$174.3	\$598.0	\$933.3
Savings in Out-of-Pocket Costs(\$000,000)	\$12.9	\$27.8	\$25.8
Total User Benefits (\$000,000)	\$187.2	\$625.8	\$959.1
Public Investment			
Total Capital Cost	\$2,082.7	\$5,880.3	\$10,299.3
Annualized Capital Cost (3)	\$153.2	\$435.2	\$742.2
Annual Operating Cost	\$30.0	\$75.6	\$222.0
Total Annualized Capital and Operating Cost	\$183.3	\$510.8	\$964.2
Benefit-to-Cost Ratio	1.0	1.2	1.0

(1) Excludes several projects offering duplicative services. When all projects are included, there is considerable duplication of service, resulting in costs disproportionate to benefits. When all services are included: total capital cost is \$13.4 billion; annualized capital cost is \$923 million; annual operating and maintenance cost is \$282 million; and the benefit-to-cost ratio is 0.78.

(2) Assumed value of time for person trips is \$19.58/hour - equal to 75% of average regional wage rate. Out-of-vehicle transit travel time is weighted by a factor of 2.2. Assumed value of time for truck trips is \$80/hour to reflect driver wages and overhead.

(3) Assumes 4% real discount rate

Observations for Future Work

Of equal significance to the evaluation results, are the lessons learned in the course of MTC's first effort to conduct project level performance evaluation in conjunction with the long range plan update. A number of areas have been identified for future work:

- Refine the timing of the evaluation to influence key decisions. MTC and the congestion management agencies must consider how better to time the project performance analysis so the results are available when discussions about county and regional investments first get underway. An area that deserves special scrutiny is how to use performance measures to evaluate projects before voters have endorsed a project and committed to funding it through a local sale tax measure. For example, several Bay Area counties developed sales tax expenditure plans for consideration by the voters in November 2004. In many cases, the critical consensus building required to develop expenditure plans had already taken place by the time the project performance measures were released.
- Focus the evaluation on a smaller number of key investments to allow more meaningful evaluation. MTC can do a better job of identifying the major

investment decisions and focusing its analysis resources on those projects. These could include big ticket items, projects likely to have regionally significant impacts, and investments closely aligned with MTC policy initiatives such as lifeline transportation or coordination between transportation and land use. This approach would yield more meaningful information for projects of special interest. It would allow us to go beyond measuring future needs and facilitate the comparison of individual project benefits and costs for the most regionally significant projects.

- Consider developing a composite score for each project to facilitate comparisons. It is important to develop a method to synthesize the performance measures so the projects that move the region furthest toward the Transportation 2030 Vision rise to the top. One approach is to develop a composite score for each project by weighting each of the measures. A measure comparing project benefits and costs could also serve this function for certain types of projects.
- Continue to review emerging practices to improve evaluation methodologies. There is a particular need for better measures and improved methodologies for difficult-to-measure goals such as Reliability and Livable Communities.